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GINNING PIMA COTTON IN ARIZONA[1]

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DIVERSE METHODS USED IN GINNING PIMA COTTON

In tracing the diversity of roller-ginning methods in Arizona it is necessary to consider not only the actual ginning operations but the different processes or treatments to which the cotton is subject, from the delivery of the seed cotton by the farmer to the turning out of the finished bale. It will be seen that most of the attendant operations, as well as the ginning processes, were conducted in different ways and with a variety of mechanical equipment that also contributed to the diversity of the product.

[1] The use of roller gins in the United States was limited formerly to the districts in South Carolina, Georgia, and Florida where Sea Island cotton was grown, but roller ginning has been required for the Pima variety of Egyptian cotton, which has been grown in recent years in Arizona. Under western conditions new phases of the ginning problems have been encountered. The labor costs are higher, so that some of the Sea Island methods are less applicable. Several types of roller gins were represented in the different ginning establishments of the Salt River Valley, with cleaning and handling devices of various kinds partly carried over from saw gins, to which the previous experience of many of the ginners had been limited. An investigation has been necessary to determine the effects of different treatments at the gins upon the appearance and commercial value of Pima cotton.

On account of differences in the appearance of the bales, some manufacturers of fine goods have considered that Pima cotton was not suited to their purposes. The diversity in the mechanical condition of the cotton which gave the different appearance undoubtedly has tended to restrict the use of Pima cotton among fine spinners and even caused some shipments to be rejected. Thus, the essential uniformity of the Pima stock, which has been maintained by careful selection and guarding of the seed supplies, has not been

The seed cotton is sucked from the farmer's wagon by a pneumatic conveyor into the gin building or into a storage house. In some establishments the cotton goes through a mechanical cleaner on the way to the storage house, while in others the only cleaning is done immediately before ginning. Most of the cleaners are of the picker-roll type, consisting essentially of revolving wooden cylinders studded with steel spikes, but these often are supplemented by other devices for shaking and sifting out the broken leaves and other foreign matter.

Though all of the gin plants have cleaners of the picker-roll type, they are used in different ways. The seed cotton may be run through three of these cleaners in the storage building and through three more in the gin house, or only the three cleaners in the gin house may be used. The speed of the picker rollers in different gin plants varies from 125 to 280 revolutions per minute.

After cleaning, the seed cotton may be deposited on the upper floor or carried on a belt or a pneumatic distributor to the feeder box over the gins. If dropped on the floor, the cotton either is taken up again by a pneumatic conveyor or is pitched or shoved into a chute. Each chute may supply a single gin stand, or two gin stands may be fed from one chute if the feeding is done by hand.

When mechanical feeders are used the cotton passes first into a so-called cleaner feeder with a single picker roll, which in a short-staple gin serves to separate the cotton and feed it to the saws. But for roller ginning the cotton from the cleaner feeder usually falls into a box in front of a special feeding device. This is an endless belt of canvas having projecting sharp spikes that travel up one side of the box and carry small masses of seed cotton to the gin roller. Some ginners have abandoned these special feeders and have adjusted the cleaner feeders so that they keep the right quantity of seed cotton in front of the moving knife.

Several variations were found in the adjustments of the knives to each other and to the gin roller. Some ginners adjust the gin so as to have a short overlap on the fixed knife and a great pressure on the roller, while others use a long overlap of the knives and only enough pressure to pull the cotton over the roller, with resulting interruptions in the movement of the cotton, a condition termed "hesitation."

In the different establishments the speed of the crank of the moving knife varies from 600 to 850 revolutions per minute. Most of the

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fully recognized or appreciated by manufacturers because the treatment in ginning was not uniform.

In seeking the causes of the diversity there was need to check over the entire ginning operation, and the results may serve as the basis of further investigations of the ginning processes, which undoubtedly are much needed. Diagrams and brief statements of the general mechanical principles of roller gins are to be found in encyclopedias and other reference works, but Mr. Townsend's description of the gin operations apparently is the first detailed account of the principles, methods, and precautions that are required in constructing and operating roller gins. In relation to different types of cotton gins for use in British India an elaborate Report on Cotton Gins and on the Cleaning and Quality of Indian Cotton, by Dr. Forbes Watson, was published in 1879, but the Arizona ginning problems are not the same. The present study in Arizona was preceded by long experience and familiarity with roller ginning in South Carolina. As a practical result of the investigation Mr. Townsend has devised an attachment for removing the lint from the gin roller in a manner that straightens the fiber and improves the appearance of the cotton, so that higher grades are secured. This attachment has been patented and dedicated to the free use of the Government and the people of the United States. The new device was adopted and used by two of the gin plants in the season of 1923. This may be considered as a practical demonstration, showing that it is possible to secure much greater uniformity in the appearance of the baled cotton and of the commercial samples.—O. F. Cook.

gins are of the 40-inch roll type with a single moving knife, while other gins use long rollers, some 5 and others 7 feet long. One type of gin with long rollers has the moving knife divided into three parts, with alternating movements to reduce vibration.

The fixed knife is set in some cases with the edge on a level with the center of the roller and vertical with the top cross rail, while in other establishments the knife is set one-eighth of an inch above and one-eighth of an inch back, or away from the vertical line of the top cross rail. Certain ginners use a fixed knife with the edges beveled on one side, while others have the knife beveled on both sides.

The material used in covering the gin rollers varies widely. A few gins use an all-walrus-hide roll; others have one-half walrus hide and one-half packing, or one-third packing and two-thirds walrus hide, or vice versa. In some plants the rollers are left with entirely smooth, even surfaces, while in other establishments diagonal mote grooves are cut across the strips of hide, the distance between the grooves varying from 2 to 5 inches on the roller. The rollers are run at different speeds, from 100 to 130 revolutions per minute.

One of the principal causes of diversity in the appearance of samples or bales was located in the brushes that were used to remove the cotton from the gin rollers. Depending no doubt upon the condition of the cotton as well as upon the construction and adjustment of the brushes, the cotton was often packed, wadded, or crumpled between the rollers and the brushes. (Pl. I.) The action of the brush was to collect a mass of lint that was folded back and forth until a sufficient quantity accumulated to cause it to fall to the floor. (Pl. II.) The surface of the roller passing against the lint that was held on top of the brush continued to roll and pack the cotton held on the brush, so that it became rough and ropy in appearance. Also small wads of lint were twisted and carried between the brush and the roller, so that they dropped in front of the dirt screen, or behind it into the seed auger, or were carried under the roller and caused backlashing. The folded masses of lint that had been packed together by the brushes were pressed in that condition into the bales, so that even in the same bale there might be a wide variation in the mechanical condition and appearance of the cotton. The rough ropy lint was mixed irregularly with smooth straight lint, so that samples drawn from the same bale often were quite different in appearance and the bale had to be classed from the inferior sample.

In view of the difficulties and losses that were being occasioned by this method of removing the cotton from the gin rollers, special consideration was given to the development of a better method. After a series of experiments conducted by the writer in the Salt River Valley in cooperation with local ginners, it was found that a rapidly revolving auxiliary roller with flexible flaps, and hence called a flapper roller, could replace the brush and give very satisfactory results. (Fig. 1.) By this new method the cotton is taken from the gin roller without being folded or rolled. The cotton falls behind the gin in a smooth, fluffy, uniform condition, better in appearance as well as for textile use, since the mill processes can open and straighten the fibers more readily. The flapper-roller device

and the effects of its use upon the condition of the cotton are described later.

It was noted at some gins that the lint was carried by hand from the gin stand to the press box, while in others it was pushed on rough floors to the press. Where carried by hand, the lint was often rolled into a bundle so that it became tangled. The lint pushed on the rough floors was rolled and twisted, and the grade often was thus lowered.

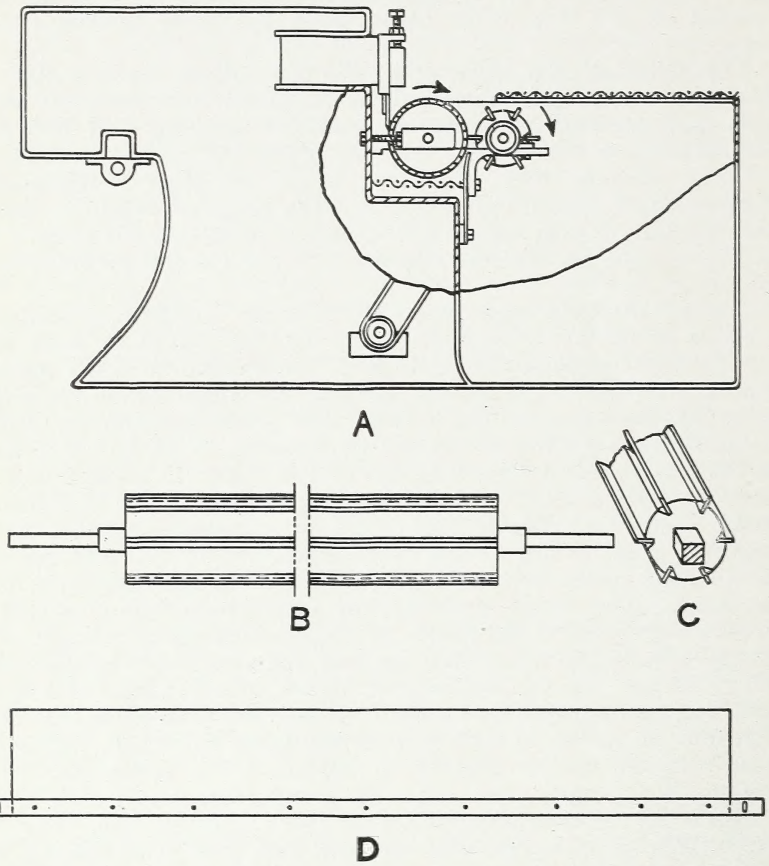


FIG. 1.—Diagram of an attachment for removing lint from the roller of a cotton gin: A, Side elevation of a portion of a cotton gin, with parts broken away to show the application of the attachment; B, elevation of the flapper roller; C, perspective view of one end of the flapper roller; D, front elevation of the air-current breaker

Another factor that affected the grade was the casings, or housing, of the gin stand. In some gin plants they were so badly adjusted that occasional locks of seed cotton slipped around the ends of the rollers and became mixed with the ginned cotton. Others had defective casings which allowed some of the ginned seeds to be mixed with the lint and passed into the bales.

With such a variety of ginning methods and differences in construction and handling of the gins it is inevitable that there should be a diversity in the appearance and condition of the cotton in the

bale. In order to gin a product which will be more uniform some standard method needs to be recognized and applied.

As a result of this survey it appeared that more information was needed regarding the principles, construction, and operation of the gin machinery and especially regarding the treatment which determines the mechanical condition and appearance of the cotton in the bales after the actual ginning is accomplished.

NORMAL EQUIPMENT AND OPERATION

The following description of the various working parts of roller cotton gins and of their functions is given in order that a better understanding may be had of the necessity for changing to a more standardized method. The suggestions regarding the proper adjustment of the various parts were developed in conferences with commercial operators of roller gins in the Sea Island cotton district of the Southeastern States as well as in the Salt River Valley. Though changes of the existing equipment may not be made at once, greater uniformity may be reached by gradual changes determined by a general understanding of the principles and requirements of normal gin operation, which are stated briefly in the following pages.

PICKING AND STORING SEED COTTON

The condition of the cotton as it comes to the gin is an important factor in determining the quality of the product. The farmer should understand the need of picking and handling the cotton so that it can be brought to the gin in proper condition for ginning. One difficulty is that most farmers are without facilities for storing their cotton and take it to the gin as soon as it is picked, before the moisture content is equalized. Freshly opened bolls naturally have much more moisture than bolls which have been open for five or six days; also cotton which has been picked early in the morning has more moisture than cotton picked in the afternoon. If cotton could be stored in a dry place for three or four weeks, the dry cotton would absorb some of the moisture from the wet and a more uniform condition would prevail. Satisfactory ginning can not be done if cotton lies out in wet weather or is picked and ginned too soon after a rain. (Pl. III.) These are matters that the farmers themselves should realize and take the necessary steps to control.

USE OF PICKER-ROLL CLEANERS

On arrival at the gin the seed cotton should be examined by the gin manager. If the cotton has been picked clean and is in good condition for ginning it should go directly to the gins instead of passing through the special picker-roll cleaners, as the cleaner feeders will take out the small quantity of trash that comes in carefully picked cotton. (Pl. IV.)

A picker-roll cleaner is necessary to clean cotton that has been carelessly picked and is trashy. (Pl. V.) Usually only three picker rolls are used. These should be run at 175 revolutions per minute, with the cotton dropping on a shaker that has a slight vertical motion to throw the cotton up and down. A horizontal motion is objectionable because it tends to roll and twist the cotton. But twisting may result

when a greater number of picker rolls are used or if they move at a greater speed. It is not desirable to pull the locks apart and separate the individual seeds, since this results in more twisting of the fibers, or the fibers may be rolled so closely around the seeds that they pass through the grids with the ginned seed. (Pl. VI.)

DISTRIBUTING THE SEED COTTON TO THE GIN STAND

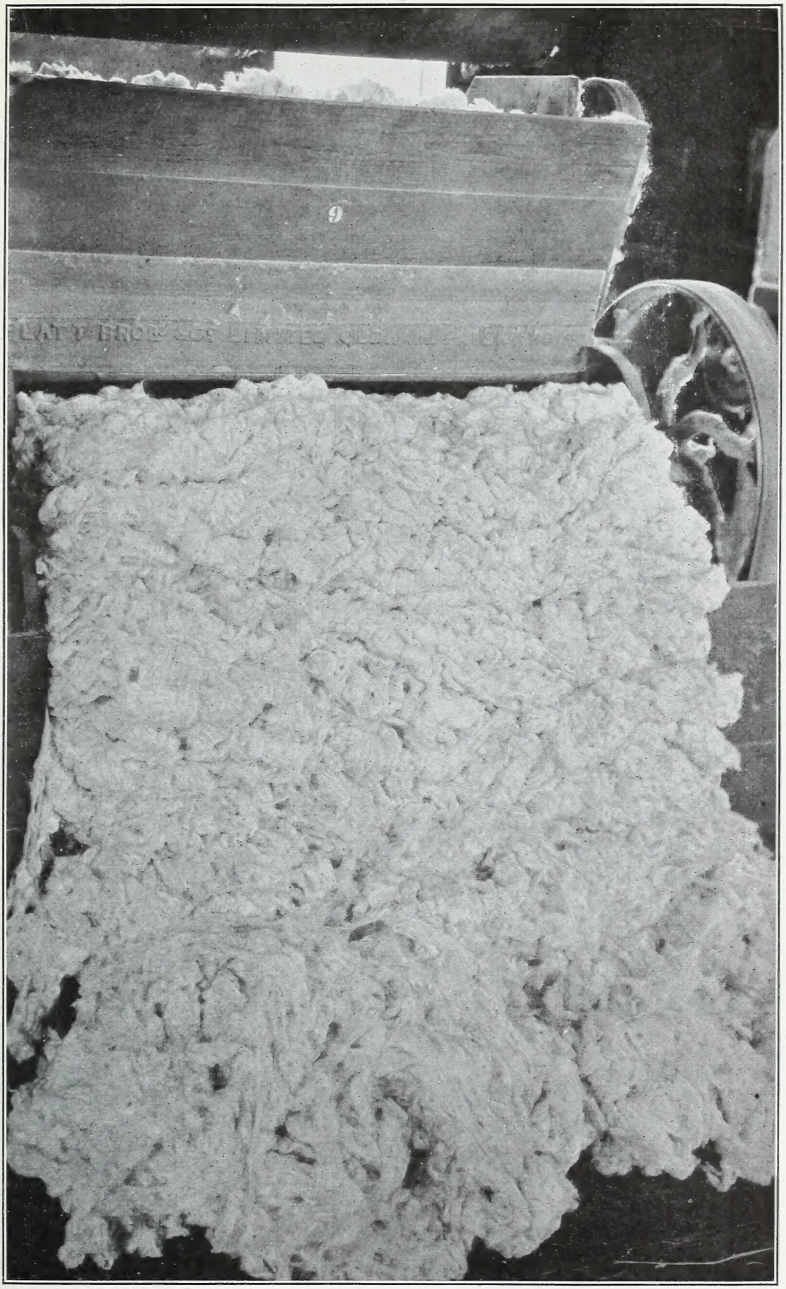
For long-staple cotton the pneumatic-elevator method of distribution to feeders is preferable to the belt-conveyor system, having less tendency to roll and tangle the fiber. Of course, the worst tangling and rolling occur when the overflow cotton is resucked, so that it passes over the belt a second time.

FEEDING THE SEED COTTON TO THE ROLLER

Feeding by hand gives the best sample of ginned cotton but is more expensive, so most of the gin plants use mechanical feeders. With the mechanical feeders the cotton falls from the cleaner feeder into a box on the gin stand. This box may be stationary and may have a sloping bottom so that the cotton rolls forward, or the box may be agitated to carry the cotton forward to the gin roller. In such feeders the box has a flat perforated bottom through which dirt and small leaf trash may fall. (Pl. V, fig. 2.) The seed cotton is taken from the box by a broad endless belt of canvas having numerous wire spikes that carry small masses of seed cotton and deposit them in front of the gin roller. These feeders tear more of the locks apart and also are likely to keep too much unginned cotton on the seed grid. This, in turn, prevents the ginned seed from falling through the grids promptly, and the seeds tend to accumulate in front of the roller, blocking the unginned cotton. Though these feeding devices are the best available at the present time, further improvement should be sought to give increased efficiency in ginning.

CONSTRUCTION AND CARE OF THE GIN ROLLERS

The gin rollers are wooden cylinders with a covering of walrus hide in the form of strips about three-fourths inch wide laid on spirally and held in place by glue and wooden pegs driven through the hide into the wooden core. To avoid the expense of walrus hide different kinds of leather and several other substitutes have been suggested and tried, but none with complete success. Some combinations of walrus hide with rubber packing or friction paper are practical and even superior in some respects to walrus hide alone, as well as more economical. The packing or paper is put between the strips of walrus hide and should never be thicker than a quarter of an inch, as its chief function is to keep the fixed knife from wearing the leather too fast. The paper or packing is harder than the leather and takes most of the pressure of the knife, leaving just enough pressure on the leather to pull the cotton over the gin roller. Also the packing or paper, having a uniform consistency, will wear evenly and keep the roller true, so that repairs are not required so frequently. If the leather wears in holes the paper will lap over and fill them, thus obviating the danger of cracking seed. Friction paper is better than rubber packing but more difficult to put on the roller.



GIN STAND WITH A BRUSH TO REMOVE THE LINT FROM THE ROLLER

The mass of lint shown has been held by the brush against the roller and thus packed and folded, especially at the ends. Much of this cotton will look rough and ropy in the sample. (See Pl. VIII)

A TYPICAL 20-STAND ROLLER GIN

Lint is shown coming over the rollers and brushes and falling to the floor

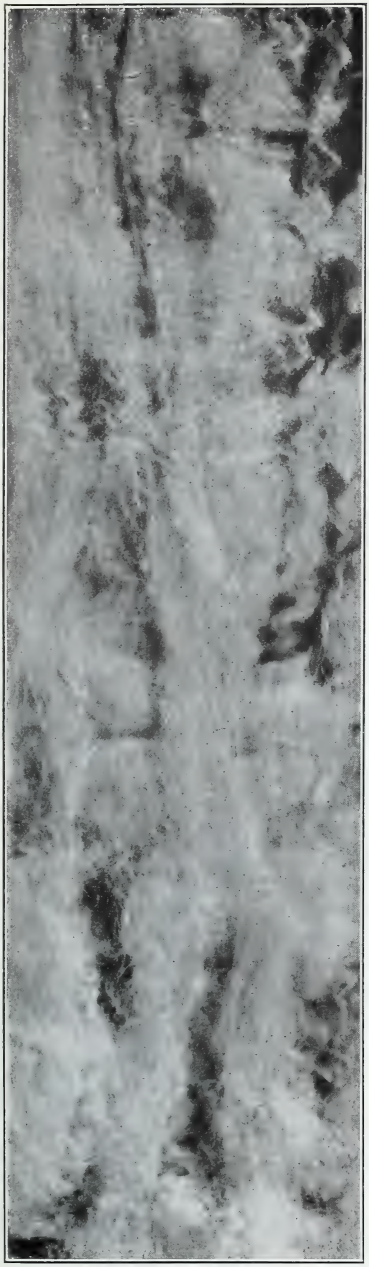


FIG. 1.—LINT THAT HAS BEEN CLOSELY FOLDED OR CRUMPLED AS A RESULT OF GINNING WHEN DAMP

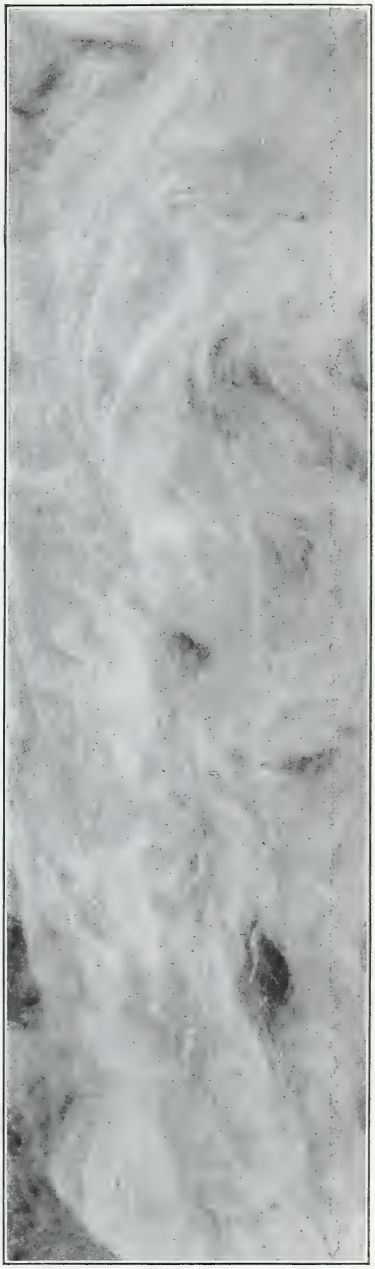


FIG. 2.—SAMPLE OF LINT TAKEN FROM THE ROLLER WITHOUT USING A BRUSH

Note its smooth, straight, and even appearance

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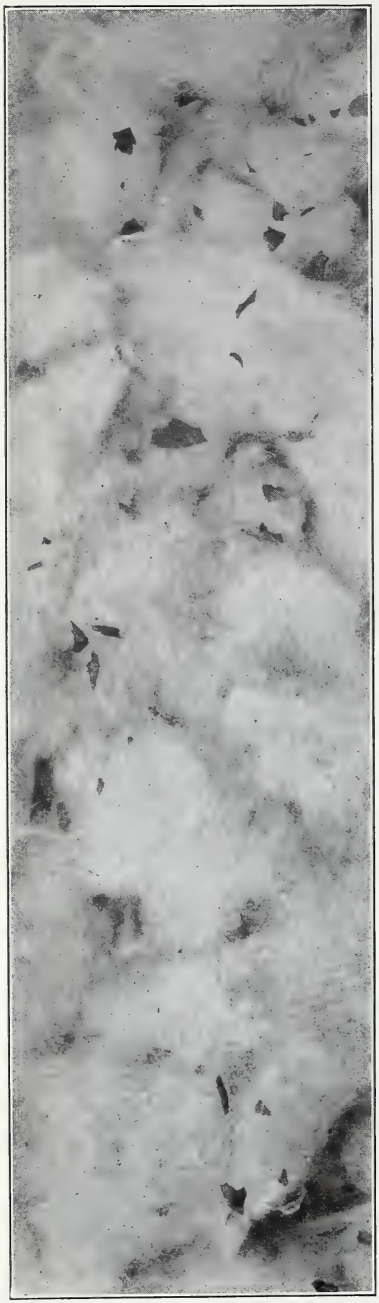


FIG. 1.—SEED COTTON BEFORE PASSING THROUGH THE PICKER-ROLL CLEANERS

Particles of broken leaf material are shown

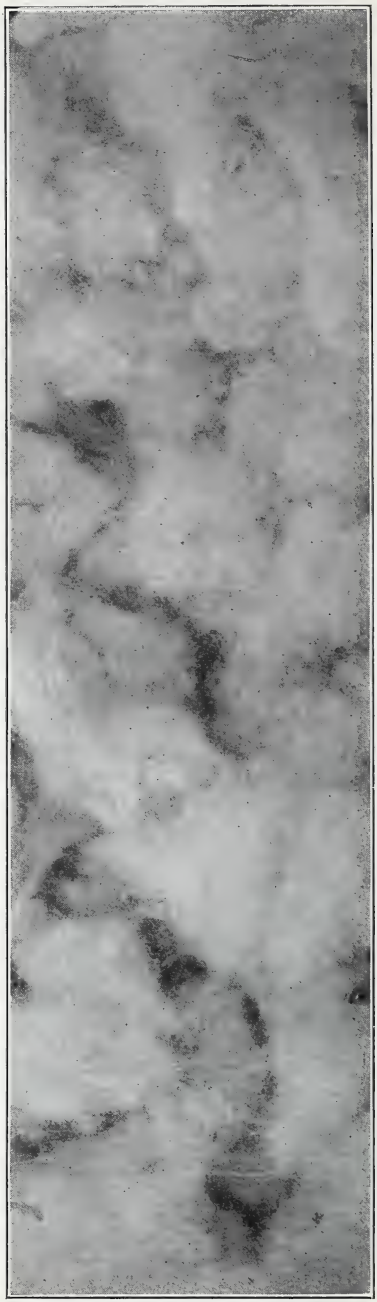


FIG. 2.—THE SAME COTTON AFTER PASSING THROUGH THE PICKER-ROLL CLEANERS TO REMOVE THE TRASH

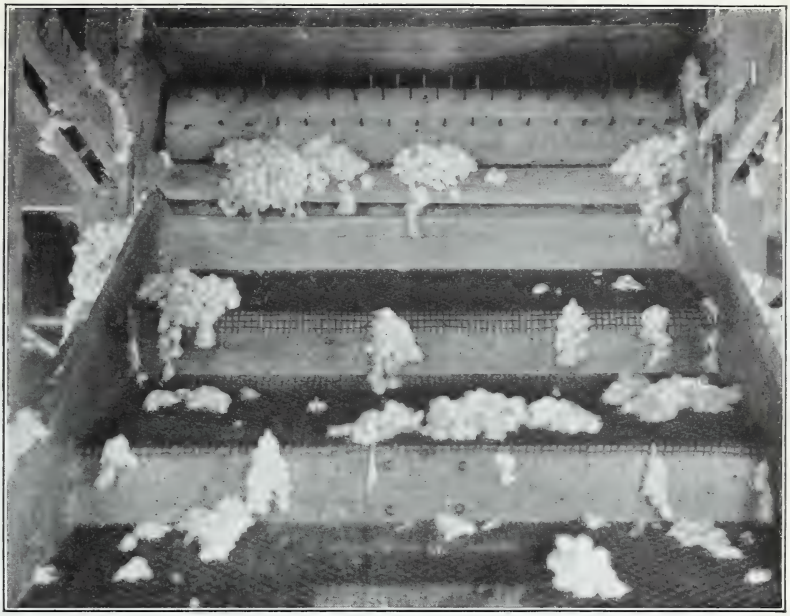


FIG. 1.—END VIEW OF A PICKER-ROLL CLEANER WITH SCREEN TO REMOVE DIRT AND LEAF TRASH

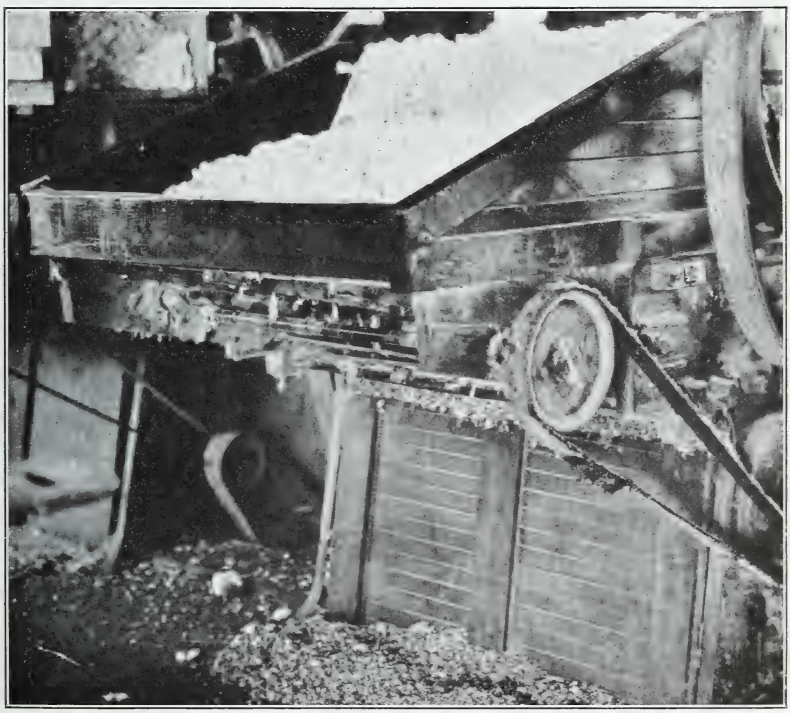
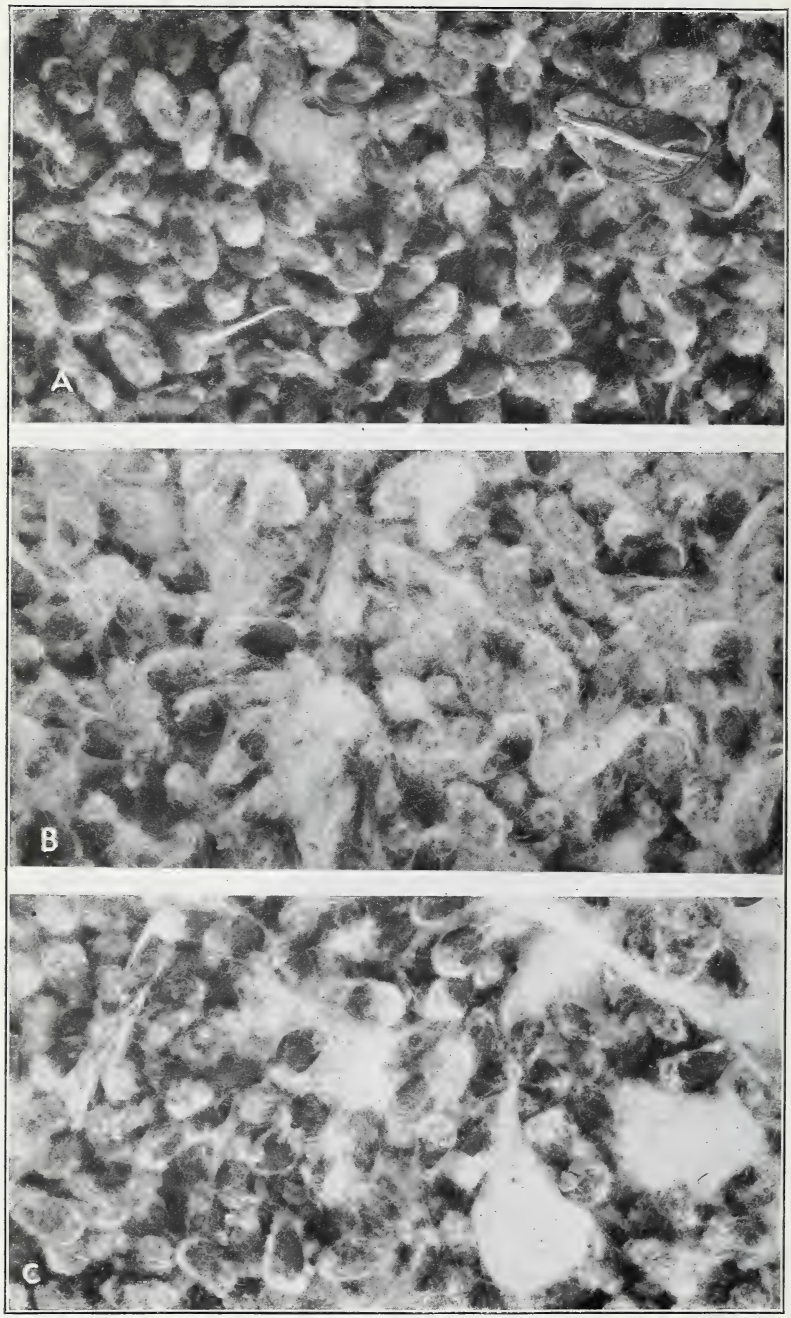
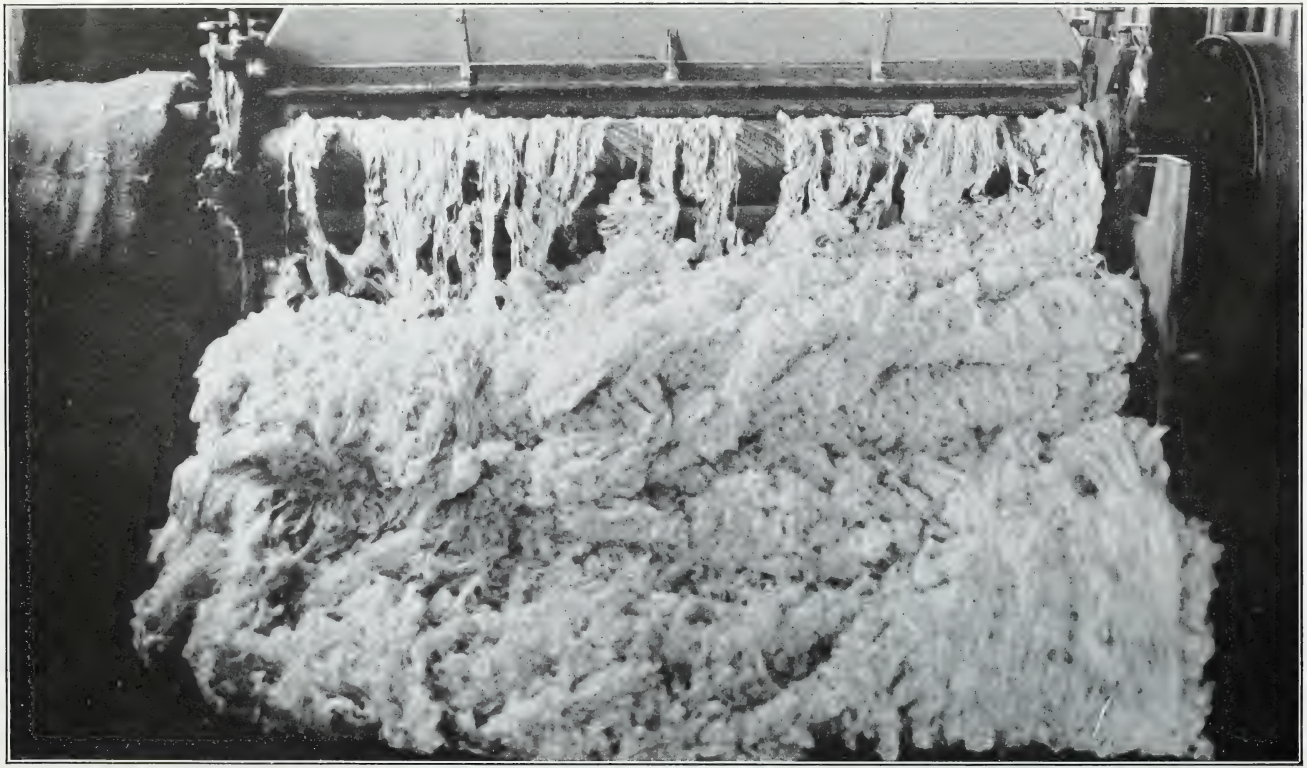


FIG. 2.—GIN STAND EQUIPPED WITH A BOX AGITATED TO REMOVE DIRT AND LEAF TRASH THROUGH ITS SCREEN BOTTOM



SAMPLES OF GINNED SEEDS

A, Seeds well ginned; *B*, seeds showing some lint remaining on many of them; *C*, seeds mixed with excessive quantities of unginned seed cotton



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GIN STAND SHOWING LINT COMING OVER THE ROLLER IN SMOOTH CONTINUOUS SHEETS

Note that there is no brush to remove the lint, but only a board beneath the roller to keep the lint from following around the roller

SAMPLE OF LINT AFTER IT HAS BEEN IN CONTACT WITH THE BRUSH

Note the curled and rough appearance in comparison with the lint shown in Plate XI

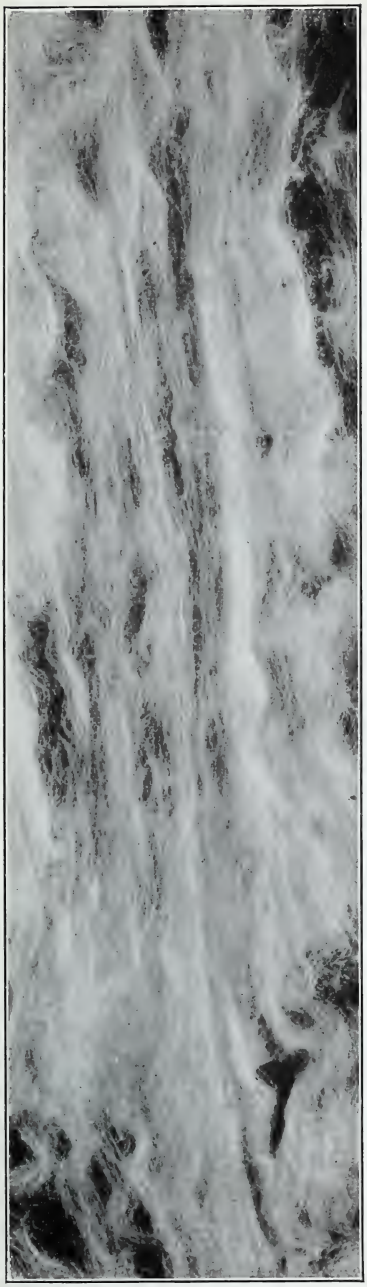

FIG. 1.—UPPER SIDE OF A SHEET OF LINT AS IT COMES OVER THE ROLLER

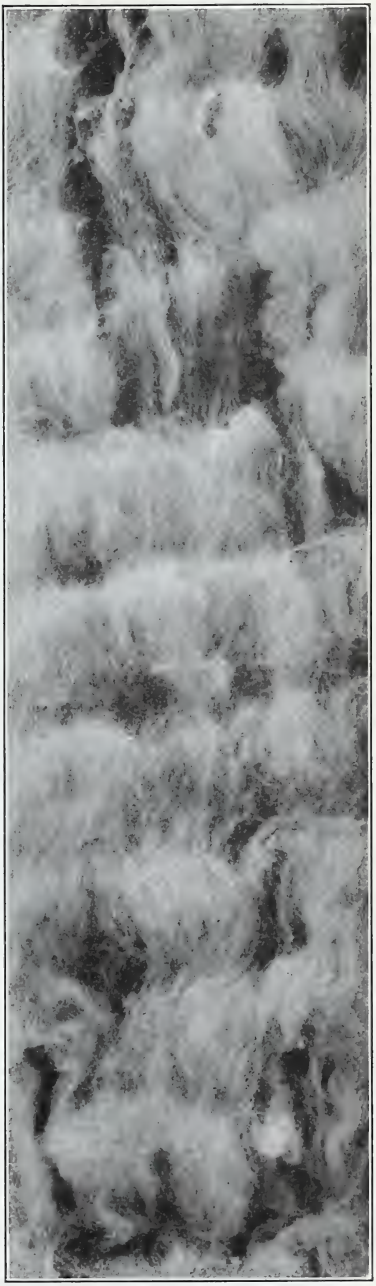

FIG. 2.—UNDER SIDE OF THE SAME SAMPLE AGAINST THE ROLLER

The inequality in the lint sheet is due to the action of the moving knife

FIG. 1.—A 10-STAND GIN WITH FLAPPER-ROLLER ATTACHMENTS FOR REMOVING THE LINT FROM THE ROLLER

FIG. 2.—CLOSE-UP VIEW OF THE FLAPPER-ROLLER ATTACHMENT WITH THE SCREEN REMOVED

SAMPLE OF LINT TAKEN OFF THE ROLLER BY USE OF THE FLAPPER-ROLLER ATTACHMENT

Note the uniform appearance of the lint

All rollers should be grooved to prevent motes or small defective seeds from hanging on the fixed knife, causing crimp or cut cotton. The grooves are V-shaped, being one-eighth of an inch wide, three-sixteenths of an inch deep, and 1½ inches apart. These grooves should never be allowed to close. The direction of the grooves is diagonal and opposite to the direction of the leather strips, making one turn in the length of the roller.

Gins with a 40-inch roller and a short moving knife are considered preferable. Longer rollers have a tendency to give, or buckle, in the center, causing the cotton to wad between the fixed knife and the roller. The moving knife if too long frequently buckles in the middle when it strikes an accumulation of seed cotton. To avoid this the moving knife in some long-roller gins is made in two or three pieces, but the mechanism for driving a three-bladed knife is more complicated and difficult to repair than that with the knife in one piece. At the point where the sections of the moving knives pass each other a groove becomes worn in the roller, because at this point a little seed cotton often hangs on the fixed knife. As a result some of the seeds are often crushed and delivered with the lint cotton.

The rapidity or rate of ginning is largely dependent on the pressure of the fixed knife on the roller. With longer rollers it is more difficult to get an even pressure along the full length of the knife without danger of its buckling in the center. With long rollers, therefore, less pressure must be used and a thinner sheet of cotton turned out, which reduces efficiency. This is proved by the fact that the output per hour from gins with 40-inch rollers equals or exceeds that from longer roller types and with less trouble than is likely to occur with them. The added cost of walrus leather on the longer rollers is another objection to the use of this type.

SETTING THE FIXED KNIFE

Though most gin stands are built so as to allow for different adjustments of the fixed knife, there is no occasion in practice to make any such adjustments. This feature of gin operation can be greatly simplified by a proper setting of the knife, which remains fixed. One way of doing this is to remove the clamps which in some gins are intended to hold the fixed knife against the roller and to replace them by a single bar of quarter-inch steel, 3 inches wide. Using the same bolts the fixed knife, preferably with a single beveled edge, should be clamped against the rabbet of the top cross rail with the straight side to the roller in a position that will bring the edge of the fixed knife one-sixteenth of an inch below the center of the roller.

The desired pressure of the roller against the knife is obtained by adjusting the roller boxes. Care must be taken to adjust both ends so as to have equal pressure on the whole length of the roller, causing the cotton to come over the roller steadily. By eliminating the small clamps and giving the knife a fixed relation to the roller, there is no chance of missetting the knife, and all the gin stands can be given the same adjustment, which is essential to uniform results in ginning and the uniform appearance of the cotton.

If the fixed knife is set above the center of the roller there is danger that in trying to bring the moving knife close to it, in order to avoid cracking the seed, the moving knife will rub against the

roller. The closest approach of the moving knife should be to the edge of the fixed knife and not to the surface of the roller. If the moving knife rubs against the roller, the surface of the roller will be roughened so that the cotton will adhere and be carried under the roller, which is called "backlashing." The roller often is moistened with a wet cloth or swab to stop backlashing, but the surface soon gets rough again by the rubbing of the moving knife.

The pressure of the fixed knife on the roller should be just enough to pull the cotton over in a continuous sheet at a steady rate. (Pl. VII.) Too much pressure will produce extreme heat, causing the fiber to fold or crumple and giving the cotton a rough appearance. Samples of such cotton also are likely to appear somewhat darker in color on account of the shadows that are cast by the uneven surface.

HOW THE KNIVES FUNCTION IN GINNING

The moving knife passes through a short arc, the middle of which should be at the edge of the fixed knife, the space between the knives increasing until the moving knife reaches the top of the stroke. When the moving knife is down, the cotton comes in contact with the roller and the lint is carried under the fixed knife. Some of the fiber separates from the seed the first time the moving knife goes up, while some of it still adheres to the seed. The remaining fiber draws the seed back as the moving knife goes down and again passes under the fixed knife until stopped by the seed; but with the next upward stroke of the moving knife the seed usually is knocked away, and the lint is free to pass over the roller.

When the overlap of the moving knife (its swing above the edge of the fixed knife) is too short, more strokes of the moving knife are required to separate the seed. Meantime more cotton may be accumulating under the fixed knife, and a thick sheet may be formed which comes over the roller in a badly crimped or rough condition. (Pl. VIII.) With a longer overlap of the moving knife the cotton goes through more quickly, and since there is then less accumulation of cotton under the fixed knife the fiber comes over the roller in a thinner sheet, giving it a much smoother appearance. When the moving knife has only a short overlap, the upper surface of the sheet of cotton coming over the roller usually is much smoother than the lower surface which lies against the roller, the roughness of the sheet of fiber being due to the accumulation and crumpling that occur. (Pl. IX.)

ADJUSTMENT OF THE MOVING KNIFE

The overlap of the moving knife should be at least three-quarters of an inch when the length of the staple is from $1\frac{5}{8}$ to $1\frac{11}{16}$ inches. If the fiber is shorter, the moving knife should be lowered to reduce the overlap, while for a longer staple the knife should be raised to increase the overlap. The speed of the roller should be 100 revolutions and that of the moving knife 700 revolutions per minute. At these speeds the gins will stay set, and unnecessary wear on the roller and moving parts will be eliminated. Greater speeds heat the moving parts and tend to prevent the seed cotton from coming in contact with the gin roller.

ADJUSTMENT OF THE SEED GRID AND PUSHER BOARD

The seed grid should be set as close to the moving knife as is necessary to keep the seed cotton from falling through with the ginned seed, and it should be low enough to expose all available roller space, giving the seed cotton the maximum degree of contact with the roller. Accumulation of seed on the grid in front of the roller undoubtedly reduces the efficiency of the gin, and there is a tendency on the part of ginners to pull back the grid in order that the seed may fall through easily. The danger is that many unginned seeds will fall through with the ginned seeds, causing a loss of fiber.

The adjustment of the pusher board that moves back and forth on the grid is also very important. This board must come close enough to the roller to push the seed upon the moving knife in order that the latter may knock the seed back upon the fingers of the grid. If the pusher board is set too far away the seed will stay too long in front of the roller space and interfere with more unginned cotton coming in contact with the roller.

REMOVING THE COTTON FROM THE ROLLER

The brush system used in the Sea Island districts to remove the cotton from the roller has not proved satisfactory in Arizona. However, a new method has been devised and very satisfactory results obtained in the Salt River Valley by substituting for the brush a supplemental rapidly revolving roller with flexible flanges or flappers, called a flapper roller. (Pl. X.) This consists of a wooden roller 4 inches in diameter, provided with six flaps of $\frac{1}{16}$-inch packing made of rubber or some other flexible material which will keep a smooth edge. These flaps protrude three-quarters of an inch from the face of the wooden roller.

The roller is set back of the walrus-hide gin roller, on the same center, by means of special castings, and should be so adjusted that the edges of the flaps are as close to the gin roller as possible without touching it. The roller should be run at about 700 revolutions per minute, the same speed as the crank or moving knife, and can be driven by a belt from a pulley on one end of the crank.

The flaps of the rapidly revolving roller lightly strike the sheet of cotton coming over the gin roller and lift it off, at the same time tending to straighten the fibers and throw out some of the dirt and foreign matter.

An important feature is a provision for controlling the air current created by the flaps. If the air is not controlled it carries some of the cotton back under the rollers and may result in backlashing or in the loss of some of the cotton among the seed. The air-current breaker is a piece of sheet iron 8 inches wide and 40 inches long with a slight curve on one edge of the long side. It is fastened to the back of the gin stand and so adjusted that the curved edge will come between the two rollers and as close as possible to the gin roller without touching it.

To further prevent the lint from being blown about by the air current a piece of sheet iron about 30 inches square should be fastened on each side of each gin stand. A screen cover placed across the upper edges of these side pieces will catch motes and other trash

thrown up by the flapper roller, while the lint passes below. The screen should be set about 2 inches above and just back of the flapper roller. The arrangement of the flapper roller and other parts is shown in Figure 1.

By using this method of taking the lint off the gin roller much greater uniformity in the appearance of the cotton is possible. (Pl. XI.)

MOVING THE LINT COTTON FROM THE GIN STANDS TO THE PRESS

The lint cotton should go to the press in the same condition that it comes from the gin stand, and all unnecessary handling, turning, or bundling should be avoided. The cotton should be drawn from the individual gin stands by means of a board rake 6 inches wide and 3 feet long. A good procedure is to start at the gin nearest the press, drawing the pile of cotton from the gin, facing it toward the press, and continuing this operation until the last gin stand is reached. The cotton should then be slid over a smooth floor to the press, keeping the piles lined up and in the same shape as when they came from the gin. It is then pushed into the press and tamped lightly, but should not be turned over or jammed down in the corners. If cotton accumulates behind the gin stand while a bale is being tied the lint should be pulled into the middle of the floor. The piles of cotton should never be tangled into a heap, but should always be kept straight with the press. If more than 10 stands are used it will be more practicable to have a double box press or two single box presses. If too much cotton accumulates on the floor it is impossible to get it into the press in proper shape without tangling. Furthermore, the danger in case of fire is greater. The Department of Agriculture strongly recommends a grounding system and the proper operation and maintenance of equipment for preventing fires during the ginning process. See United States Department of Agriculture Circular 271, Grounding Cotton Gins to Prevent Fires.

KEEPING THE LINT CLEAN

Some ginners pay little attention to the adjustment of their equipment and to the condition of their gin floors, allowing trash or seeds and locks of unginned cotton to become mixed with the lint. If such carelessness is criticized they are likely to say, "A few seeds and a lock or two of seed cotton do no harm, as the cotton is cleaned when it gets to the mills." This shows ignorance and a disregard of the interest of the growers, since bales of cotton often are given a low grade or rejected by careful buyers if seeds or unginned locks are found in the samples.

CONCLUSIONS

On account of the diversity of roller-ginning methods used in Arizona, Pima cotton in the bales often differed so much in appearance that some manufacturers of fine goods have believed that Pima cotton is of uneven quality and not suited to their purposes. In reality, the select Pima variety is much more uniform than any of the seed stocks that were secured from Egypt, and the varied appearance of the bales has been due to the mechanical condition of

the cotton produced by the methods employed in the different ginning establishments.

An appreciation by gin operators of the need of using the same methods and precautions in the construction, adjustment, and operation of roller gins and in the handling of the cotton from the gin to the finished bale would make possible a much greater uniformity in the appearance of the baled cotton and of the commercial samples.

As a result of investigations conducted in Arizona by the Department of Agriculture an attachment was devised for removing the lint from the gin roller in a manner that straightens the fibers and improves the appearance of the cotton, so that higher commercial grades are obtained. This may be considered as a practical demonstration that it is possible to produce bales of Pima cotton of uniform appearance and thus remove the objections of the manufacturers of fine goods. This device has been patented and dedicated to the free use of the Government and the people of the United States.

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